THE PROBABLE IDENTITY OF *TRYPANOSOMA CONGOLENSE* (BRODEN) AND *T. NANUM* (LAVERAN)

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In our paper on the identification of the more important mammalian trypanosomes, we have regarded *T. dimorphon* (sensu Laveran and Mesnil), *T. confusum* (Montgomery and Kinghorn) and *T. pecorum* (Bruce) as synonymous with *T. congolense*, which was first described by Broden in 1904. In the same year Laveran described a similar parasite found by Balfour in the Sudan, under the name of *T. nanum*. These parasites are identical morphologically in that they are both short aflagellar trypanosomes measuring 8 to 19μ in length. The sole distinguishing feature is their effect on small laboratory animals, *T. congolense* being described as pathogenic for monkeys, dogs, rabbits, guinea-pigs, rats and mice, while *T. nanum* is considered to be incapable of infecting these animals. The object of this paper is to examine the evidence upon which this distinction is based and to decide whether it is sufficient to warrant such a differentiation.

In previous papers* a description has been given of two trypanosomes which were present in the blood of a naturally infected horse sent over to this country from the Gambia. One of the parasites was unquestionably *T. vivax*: concerning the identity of

* Yorke and Blacklock. The trypanosomes found in two horses naturally infected in the Gambia. Annals of Tropical Medicine & Parasitology, 1911, Vol. V, p. 413.

Blacklock. The trypanosomes found in a horse naturally infected in the Gambia. A double infection. Annals of Tropical Medicine & Parasitology, 1912, Vol. VI, p. 107.

the other there was, however, considerable doubt. Morphologically, this parasite was indistinguishable from *T. dimorphon* (Laveran and Mesnil) and *T. nanum*. As we finally succeeded in infecting small animals with the trypanosome, it was eventually decided that it was *T. dimorphon* (*T. congolense*).

Both the parasites, which were separated fortuitously, one from the other as already described, have been kept in experimental animals for a period of 18 months. The results of artificial passage of the short aflagellar parasite from animal to animal are so interesting and suggestive that we have decided to describe them in some detail.

The sub-inoculations made with this parasite from the time of its isolation until the 51st generation are given in genealogical form in the table. A study of this table reveals two facts, viz.:—

(1) Most of the early inoculations failed to infect, whereas the later were invariably successful.

(2) The course of the infection in the earlier successful cases was chronic, whereas that in the later instances was acute. Thus, if we consider the animals used in the second to the fourth generation, we find that these comprise 8 rats, of which 3 were positive and 5 negative; 4 mice, of which 2 were positive and 2 negative; 3 rabbits, 2 positive and 1 negative; 4 guinea-pigs, 2 positive and 2 negative; and 3 goats, 1 positive and 2 negative.

Again, if the duration of the disease in the earlier rats be compared with that in the later experiments, the contrast is very striking. For example, the average length of life of the first ten rats from the fifth generation to the fourteenth was 88·6 days, whereas that of the last ten rats, comprising the 42nd to the 51st generation, was only 8·6 days.

It is clear, therefore, that by passage of this parasite through laboratory animals the trypanosome has been changed from one of uncertain and chronic pathogenicity to one of great virulence.

This fact seems to us to be one well worthy of remark. That artificial passage of a strain through a series of animals does sometimes alter its virulence for that species is well known. The results*

* Warrington Yorke. On the pathogenicity of a trypanosome from a case of Sleeping Sickness contracted in Rhodesia. Annals of Tropical Medicine & Parasitology, 1910, Vol. IV, p. 351.

obtained by different workers with *T. gambiense* are illustrative of this point.

These observations appear to us to have some significance for the nomenclature of the parasite. *T. congolense* and *T. nanum* are identical morphologically, they are both spread by the same species of tsetse fly and infect the insect in precisely the same manner.

The usual way of deciding with which parasite cattle or antelope known to harbour a short trypanosome in their blood are infected, is by sub-inoculation of rats or some other convenient laboratory animal. As a rule, these animals are not too plentiful in the tropics and one or two must suffice for the diagnosis. That inoculation of one or two small animals may not afford any conclusive evidence as to whether or not the trypanosome is pathogenic, is at once realised from observing the results of the earlier inoculation of the parasite from our horse. Had the number of our experimental animals been limited, we should probably have designated the parasite *T. nanum*. Further experiments, however, showed that the trypanosomes could be made acutely pathogenic to rats.

This opens up the question as to whether there is really any difference between *T. congolense* and *T. nanum*. It is interesting in this connection to refer to the observations of other workers. Writing in 1911 on a short aflagellar trypanosome obtained from ponies naturally infected in Togoland, Weissenborn* states that the parasite was of inconstant virulence. It was most virulent for mice, but slightly so for rabbits, rats and monkeys. Only a small proportion of rats were susceptible, whilst guinea-pigs were absolutely refractory. Morphologically the parasite *T. frobeniusi* closely resembled *T. congolense*.

The Sleeping Sickness Commission of the Royal Society† write: 'If *T. pecorum*, which is usually more or less infective in the monkey, dog and rat, lives for some time in the blood of the goat, it loses its power of infecting other animals. This has given rise to the erroneous idea that a separate species—*T. nanum* exists.'

* Weissenborn, E. Beitrag zur Kenntnis der kurzgeisseligen Trypanosomen. Archiv. f. Schiffs- und Tropen-Hygiene 1911, p. 477.

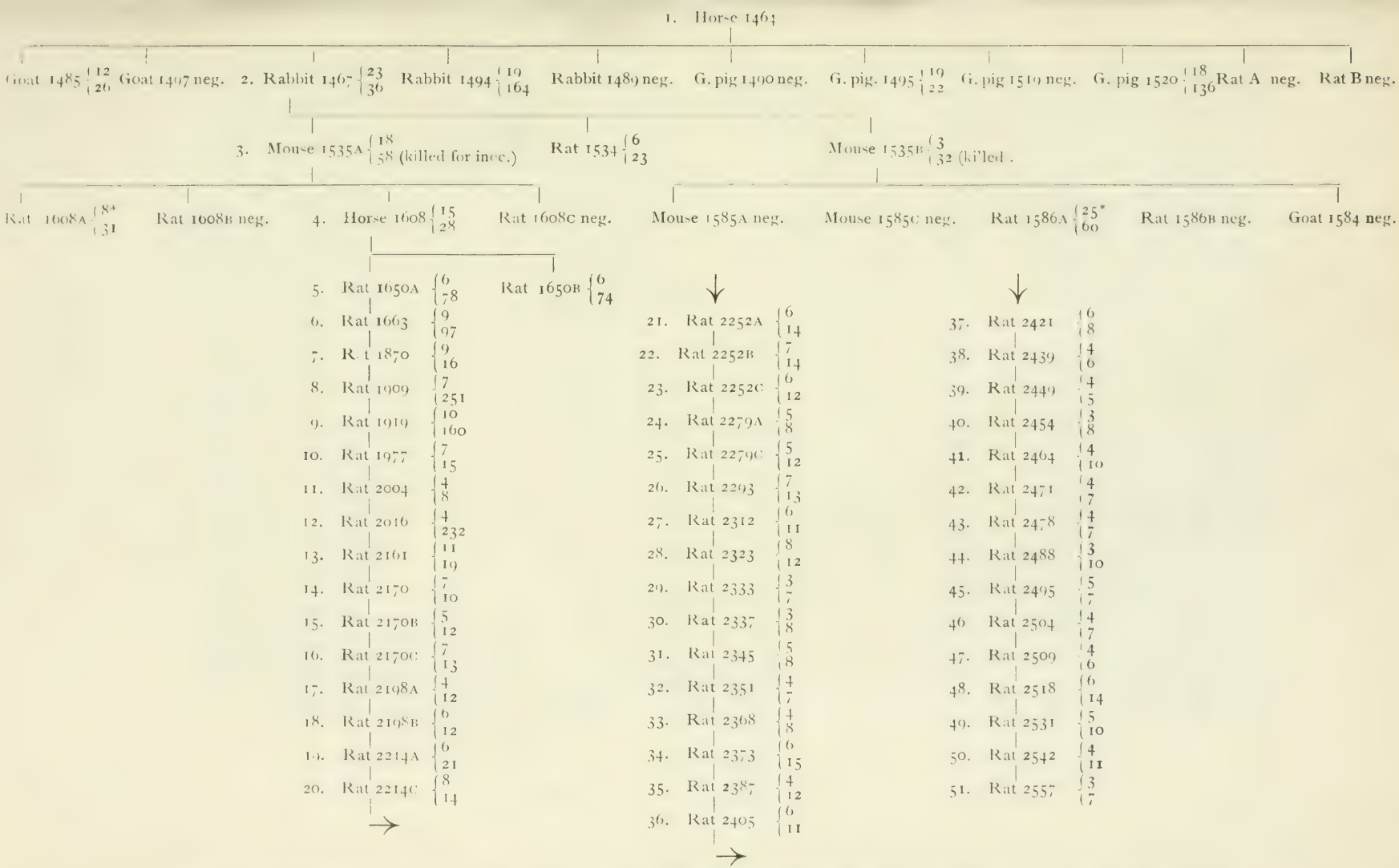
† Bruce, Harvey, Hamerton and Lady Bruce. The susceptibility of various animals to *T. simiae*. Roy. Soc. Proc., 1913, Vol. 87, p. 49.

The Belgian Sleeping Sickness Commission* found that aflagellar trypanosomes from naturally infected dogs will not always infect guinea-pigs and rats.

It is thus evident that workers in the field have found that short aflagellar trypanosomes, morphologically identical with *T. congolense* and *T. nanum*, are of uncertain pathogenicity for the smaller laboratory animals.

As the result of our investigations and of those of the authors mentioned above, we can see no evidence which would justify distinguishing one from the other on the ground of pathogenicity. In the present state of our knowledge we can only conclude that *T. congolense* and *T. nanum* are the same parasite.

* Rodhain, Pons, Vanden Branden, and Bequaert. Rapport sur les Travaux de la Mission Scientifique du Katanga. (Octobre 1910 à Septembre 1912.)



* Parasites appeared on one day only in very small numbers. The upper figures in each bracket indicate incubation, the lower duration.